

SAES-W-011 welding requirements for on-plot piping.

Pre welding inspection SAIC-W-2005

1) Approved WPS to be available at site
Weld joint Continuity from WPS.
Base material, Thickness, Bevel type, Root gap
(MTC) $(3\frac{1}{2} \pm 2\frac{1}{2})$

2) Internal misalignment 1.5 mm (max)
ASME B31.3 — process piping
Chamfering or taper boring of thicker part
ASME B31.3 30° max.

Remove oil, moisture, scale, rust from the weld surface at least 25mm from the adjacent base material.

4) Irregular edges are ground.

5) Thermally cut or gouged surfaces for all materials powers brushed

for CrMo materials min. of 1.5mm depth to be cut (Air Hardenable materials)

NDT As per spec. MPI or LPI.

6) S.S and non ferrous have been cleaned with or S.S brushes not previously used

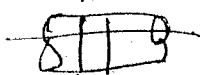
Re cut or re bevelled fittings have surfaces examined for laminations. (NDE /

7) Tack weld. Size length. 3.2 to 4.8mm $\frac{1}{2}$ " to 1".

$\leq 4"$ \rightarrow 3 Tacks
 $> 4"$ \rightarrow 4 Tacks (min)

Bridge Rides are made completely with in the work groove.

8) Min. Distance between 1hr Butt welds
20mm or 3t
whichever is greater



If not possible -
Izre NDE as
per Spec.

Improves welding inspection.

1) Joint preparation & cleanliness

WPS, welders Job clearance card (JCC) and check the range of qualification.
free of oil, moisture etc. $\frac{1}{2} \parallel \frac{1}{2}$

Coated or clad surfaces are protected from the welding arc.
Stainless steel and nonferrous is cleaned with grinding wheel.

2) Welding Environment

wind shields to be provided.

GMAW, GMAW or FCAW \rightarrow 8 kph, or 2.2 m/s. \checkmark

welding is > 30 m ~~height~~ from power source.

use remote current control.

3) Welding Consumables.

filler metal size, type and classification conform with WPS.

welding consumables shall be of the same brand, type and max. size as indicated on the WPS.

a) GMAW electrode to be used for procedures with impact toughness requirements.

b) SAW filler.

c) FCAW electrode

d) WPS/PQR using any consumable with "Q" designation.

ASME Section II C

~~6) Protect~~

1) DCEN :- Direct Current Electrode Negative
DCEP :- Direct Current Electrode Positive.

2) SAES-W-010 → welding requirements for pressure vessels
plot piping
pipe lines
off shore structures.
011 →
012 →
013 →
014 → Weld overlays and welding of clad materials
015 → Strip lining application.
016 → welding of special corrosion resistant materials

SAEP-321 → Performance Qualification Testing and Certification of Saudi Arabia welders.

322 → PQT & C of SA Brazers.

323 → PQT of contract welders & Brazers.

324 → Certification review and registration of project welders and Brazers.

SAEP-1140 → Qualification and Certification of Saudi Arabia NDT personal.

1141 → Industrial Radiation Safety

1142 → Non-Saudi Arabia NDT personal.

00-SAIP-10 → Non Conformance Reports.

00-SAIP-12 → Equipment Deficiency report.

SAES-A-004 → Pressure Testing

A-206 → Positive Material Identification.

3) ASME code for pressure piping B 31

B 31.1 → Power Piping

B 31.2 → Fuel Gas Piping

B 31.3 → Process Piping (chemical plant & petroleum refinery piping)

B 31.4 → pipe line transportation system for liquid hydrocarbons and other liquids.

B 31.5 → Refrigeration piping and heat transfer components.

B 31.8 → Gas Transmission and Distribution Piping Systems.

4) PWHT Based on ASME B31.3
20mm & above to be done for C.S

5) Low hydrogen electrodes
of H₂ \leq 8ml / 100gm of deposited weld metal.

6) wind speed 2.2 m/sec or 8 mph.

7) Essential variables:

PKR ~~WPS~~: Joint Design
Base metal
filler metal
position
Gas
Electrical characteristics.

WPS: Base metal
filler metal
preheat
PWHT
Gas
Electrical characteristics

8) ~~PKR~~ on plot piping SAES-10-011

9) checking Gases:
CO₂ → federal specification BC-C-101 Type "B"
Compressed Gas Association CGA G-6.2 Type "F"

~~PKR~~ Ar (Argon) → CGA G-11.1, Grade "A"

10) Essential variable changes.

New cops, Quality changes

11) weld area should be free from rust, oil, grease.

12) PWHT: If B.H.W. restricted 80% Yes.

13) Max. misalignment — 15mm

14) Inside Tap → 30°

ANIP: — Amine Di Iso prepanel.

15) PWHT require

1) All NaOH Caustic Soda

2) All MEA solutions (mono Ethanol Amine)

3) All DGA solutions $\geq 138^{\circ}\text{C}$ Design Temp.
(Di Glycol Amine)

4) All rich ANIP solutions $> 90^{\circ}\text{C}$ Design Temp.

5) All lean ANIP solutions $> 60^{\circ}\text{C}$ Design Temp.

6) Boiler Degreaser Service 2.0 and 2.1/3/c.

16) DMW Ferritic Steel + Austenitic S.S
+ Duplex S.S
+ Nickel Based Alloy
Not permitted for pressure containing welds
in sour service.

permitted for non sour hydrocarbon service
if made with a nickel based consumable.

17) Excess reinforcement shall ground or not before NDT

(yes) or No

18) Any NDT test shall cover min 1" on both
side.

19)

20)

21) Validation of welders 6 months.

22) ASME B 31.8 → Gas Transmission and Distributing
Piping system.

23) Max. weekly repair rate should not exceed 2%.

24) Min. soak time 1 hour

25) SMAW welding largest size electrode permitted
for socket welds. 3.2 mm ϕ .

26) S.S brushes not previously used on other
materials True

27) Dip limiter welding Are not permitted for pressure containing
welds in sour service True

12) If hard ness limits are specified the soak
time for production welds shall not be less than
80% of PQR soak time unless approved by
CSD.

SAIC-W-2004

AWHT Inspection

- 2005

Pre welding & weld joint fitup inspection.

- 2006

In process welding inspection.

- 2007

Post welding visual inspection.

- 2010

Receiving Inspection and verification of welding consumables.

- 2011

Welding Equipment Calibration verification.

W2 → for welding on Normal Services & normal conditions.

#1 → for critical welds ie Trims, buttering, ~~traps~~

SAIR-W-2006 → Daily weld fitup inspection report

SAIR-W-2007 → Daily weld production report

- 1) Document Review
- 2) Material Receiving
- 3) Installation

a) Prewelding & weld joints fit up Inspection

1) Joint Edge preparation

Marking, WPS, Base material, Thickness, Bevel type, Root Gap, Internal misalignment, Taper, Thermally cut edge surfaces, 1.5 mm depth removed by grinding, track weld sizes 3.2-45 & length 12.5 to 25" Bridge Joints, min distance 118 Butt welds

b) In process welding Inspection

1) Joint preparation & cleanliness

2) Welding Environment

3) Welding Consumables

Same type, Brand, Max size for
GMAW, SAW, FCAW, & designation.

4) Preheat

5) Back purging & shielding Gas

~~5)~~ Amps: CQA G 11.1 Gr A

@ low AS → below 1%. O₂

S. Steel & Nickel alloy → below 0.05% O₂

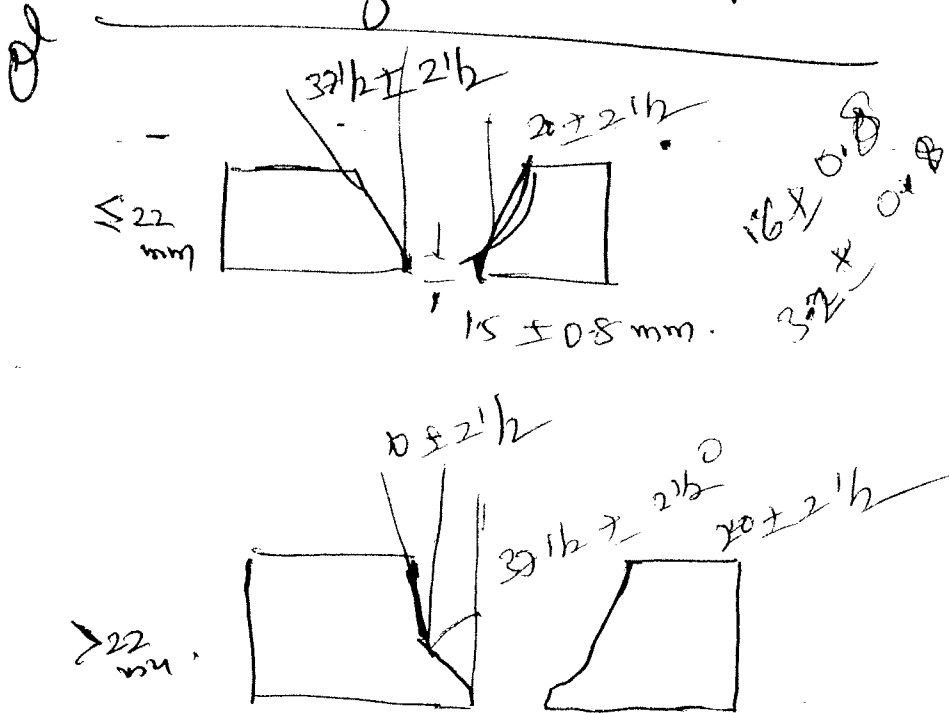
6) Root pass

7) Hot pass & weld out

$$H.P. = \frac{V \cdot A}{T} \times 60$$

Interpass → P1 → 315°C
P8 → 177°C

post working visual inspection



SAES-L-150 → pressure testing of plant piping and pipe lines.

SAES-A-004 → General requirements for pressure testing.

SAES-L-110 → Limitations of pipe joints and components.

OL-SAMSS-010 → fabricated carbon steel piping

SAES-L-105 → piping material components.

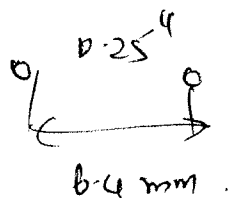
Hardness Test

(N&E RP 0472)

Portable Brinell Hardness Test

- 1) Insert the test bar into the holder with the spacing button.
- 2) Make the impression by striking the anvil not squarely with a 1.4 - 2.3 kg (3-5 lb) hammer.
- a) Measure the impression on the work test site.
Measure the diameter to the nearest half division (0.05 mm)
It should be 3 - 4 mm
Rotate the eyepiece 90° and take 2nd reading
 $R_1 - R_2 \rightarrow \phi 0.10 \text{ mm}$
- b) Same procedure measure the impression on test bar.

Test Bar Hardness - Determined weld hardness
 ≥ -10 to $+50$



Hardness exceeds ≥ 10 BHN (exceeds the specified limit)
take 3 additional readings.

Max allowed hardness $\phi 20$ I increased pressure
welder in poor service 200 BHN max

Hydrotest

All gauges shall have a range such that
the test pressure is within